INVENTIONS & INNOVATION

Success Story

FOAMED RECYCLABLES

New Process Efficiently Transforms Solid Waste into Synthetic Building Materials

Benefits

- Costs less than many competitive materials
- Can be reground and reused in the same process
- Eliminates freeze/thaw effects
- Offers corrosion, fire, high impact, and rot resistance
- Is 1/10th the density of concrete
- Is thermally and acoustically insulating
- Is far stiffer and stronger than thermoplastic "plastic woods"

Applications

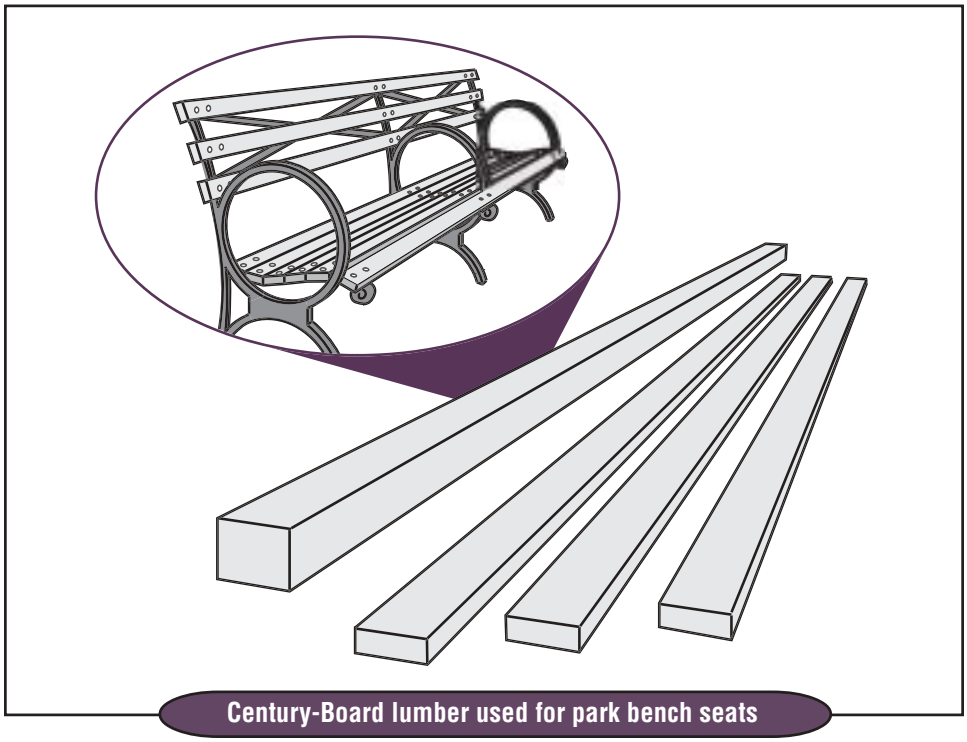
Among the products made with the Century-Board process are roof tiles, artificial slate, ceramic-like floor tiles, siding, molding, doors, utility poles, marine and dimensional lumber, picture frames, office partitions, and roof panels.

"The Inventions and Innovation grant allowed Century-Board scientists and engineers to manufacture a pilot-scale production facility in New York with the capability to make synthetic structural lumber using 70% coal fly ash as the main ingredient."

– Wade H. Brown
President
Century-Board USA

With a grant from the U.S. Department of Energy's Inventions and Innovation Program, Century-Board USA, a licensee of Ecomat, Inc., developed a process to convert solid wastes into synthetic building materials.

Many companies are now competing in the synthetic building materials market. However, to date, most of them have been restricted to manufacturing lumber for low-strength applications because of their inability to make products with the necessary strength and stiffness. For example, the greatest growth in the synthetics market has occurred in the "plastic" deck lumber area, where 30 to 40 firms are now making synthetic boards for decks out of polyethylene or a wood/polyethylene blend. These firms are able to manufacture lumber for deck surfaces only, while the substructure must still be made from pressure-treated wood. Century-Board was able to overcome this deficiency by developing a synthetic lumber with high rigidity and toughness.



Century-Board lumber used for park bench seats

Technology Description

Century-Board's process for making synthetic lumber consists of mixing up to 85% solid waste into a modified polyester polyurethane resin with special additives. This polymer system is a thick liquid that is poured into discrete molds, continuously cast, or extruded, as is done with the 'plastic' lumber. This thick liquid then forms and fills all the crevices of the mold and produces a lightweight, hard, and tough product. The material does not contain thermoplastics such as polyethylene or PVC, wood, or sawdust unless requested by the customer.

System Economics and Market Potential

Using Century-Board processing and product technology, a pilot plant was built in New York, where continuously cast products were developed and sold in volume. The plant makes synthetic lumber using 70% coal fly ash as the main ingredient. In 1999, 500 tons of coal ash from utility power plants were processed to produce synthetic lumber. In 2000, City Green, Inc., and Century Panels, Inc., purchased commercial licenses from Century-Board USA, resulting in the construction of two plants located in New York City and Sacramento, CA, each with capacity to process 1500 lb/hr of coal fly ash to make plastic lumber. This continuous extrusion process for lumber has also been licensed to two other firms.

Over 1000 utility pole cross arms, made with this synthetic lumber, were installed by a major electric utility. In similar applications, Century-Board's 8-foot-long poles passed the mechanical tests needed to perform as utility poles. The tests results showed that Century-Board poles would perform just as well as wooden utility poles. The New York City Parks Department and Housing Authority have approved this synthetic lumber for use as boards in park benches, which tend to be subjected to severe conditions. Additional boards were successfully tested on the Coney Island boardwalk.

Even though Century-Board is focusing on the fly ash-based lumber, the following have been successfully tested in their process as the major ingredients: waste glass, sand, ashes from wood and municipal waste burning, wood flour, waste from metal smeltings, red mud from aluminum refining, mixed recycled plastics, coral dust, rice hulls and rice hull ash, agricultural plant ashes, waste cotton and polyester fibers, paper processing wastes, heavy metal contaminated waste, contaminated soil, foundry sand, sewage sludge, slate dust, and rubber tires.

The Inventions and Innovation Program works with inventors of energy-related technologies to establish technical performance and to conduct early development. Ideas that have significant energy-savings impact and market potential are chosen for financial assistance through a competitive solicitation process. Technical guidance and commercialization support are also extended to successful applicants.

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